

## **Desired Future Habitat Conditions In Pool 4, Mississippi River**

### ***Description Of Pool 4***

Pool 4 is an impoundment of the Mississippi River resulting from the construction of Lock and Dam 4 as part of the 9- foot channel navigation project. Construction of Lock and Dam 4 was completed in 1935. Pool 4 encompasses approximately 62,000 from approximately river mile 752.8, near Alma, Wisconsin, north to river mile 796.9 near Red Wing, Minnesota. In general, the east and west boundaries of the Pool 4 planning area are the I & M Rail Link railroad on the Minnesota side and the Burlington Northern Santa Fe railroad on the Wisconsin side of the Mississippi River.

Unlike most navigation pools of the Upper Mississippi River, the water area in this reach includes a natural lake, Lake Pepin, that forms the widest water body in the entire Mississippi River. The lower part of Pool 4, between Lock and Dam 4 and Lake Pepin, is dominated by floodplain features created by the Chippewa River and its delta. Much of the lower part of Pool 4 was inundated due to the impoundment created by Lock and Dam 4. As the pool is traversed upstream beyond Lake Pepin, the land area in the floodplain increases. Immediately below Lock and Dam 3, the river is less influenced by impoundment and more influenced by the gate adjustments at the dam that control the water level in the pool above.

This Pool forms the border between MN and WI. Bluffs and a relatively narrow floodplain form the borders of Lake Pepin and an extensive and productive floodplain mosaic of lakes, side channels and deltas are typical of the river above and below Pepin. This represents a significant corridor of open space and habitat for both aquatic and terrestrial plants and animals. Above Lake Pepin the river's channels and backwaters provide critical spawning areas for important sport fish species such as sauger and walleye that utilize Lake Pepin most of the year.

Significant tributaries which enter Pool 4 include: The Cannon River is the largest tributary to enter the Mississippi River within upper sections of Pool 4 and the Chippewa River which enters the Mississippi River at the lower end of Lake Pepin and influences much of the floodplain features and water quality characteristics in the backwaters on the Wisconsin side of the main channel in lower Pool 4. The Vermilion River in MN, Rush River and Buffalo River in WI and several small creeks also contribute flow to the pool. Historically, the Zumbro River had distributary channels which entered Pool 4 in the vicinity of Robinson Lake. Flood control levees and channelization of the Zumbro River now limit the Zumbro River discharge to entering Pool 5. However, this channelization of the Zumbro River has resulted in eliminating the majority of suspended sediment load once contributed to lower Pool 4 by the Zumbro River.

Public lands in the upper section of pool 4 include the Wisconsin DNR's Pierce County Islands Wildlife Management Area and MN DNR's Frontenac State Park. A Wisconsin DNR state natural area (Rush River State Natural Area) is located upstream of Maiden Rock. The Upper Mississippi River National Wild Life and Fish Refuge begins near the mouth of the Chippewa River. The Chippewa River delta also has significant state land ownership in the Tiffany Bottoms Wildlife Area and the Nelson Trevino State Natural Area.

Six towns are found along the river valley; Red Wing, Lake City, Wabasha, and Reads Landing, MN and Bay City, Maiden Rock, Stockholm, Pepin, Nelson, and Alma, WI.

Resource issues for the Pool 4 vary by location but can be summarized based on location in the pool. The area in the upper pool are impacted by sedimentation associated with the suspended sediment load from the Minnesota River and island erosion due to recreational traffic. This has caused a loss in bathymetric diversity of the backwater lakes and isolated wetlands. Lake Pepin is impacted by sediment resuspension by wave action and barge travel. The lower end of Pool 4 is impacted by island loss caused by inundation and the erosive action of wind generated waves and ice action. Inundation and loss of islands has caused a change in the water flow across the floodplain. In the lower section of Pool 4, the flow can be described as "sheet flow" due to a loss of terrestrial and bathymetric features. The lower end of the pool has also seen a simplification in habitat types due to the bedload contributed by the Chippewa River. This has caused sedimentation of many backwater sites and loss of bathymetric diversity.

### ***Description of Pool 4 Sub-Areas***

Several identifiable areas are present within Pool 4. The boundaries of these area can be roughly defined based on hydrologic units (i.e. main channel, tributary deltas or bluffs). The following areas have been delineated to facilitate presentation of desired future habitat conditions in the pool:

**Gantenbein Backwater Complex:** river miles 794-800 -- Immediately below Lock and Dam 3 is an area known as Gantenbien Lakes that is owned and managed as a waterfowl hunting area by Diamond Bluff Associates. This area is bounded by the Lock and Dam 3 spot dike on the west (upstream), by the main channel to the east and south and the Wisconsin mainland on the north. Habitat quality in this area is considered good to excellent for many wetland species.

**Cannon River Delta:** river miles 791.0-796.9 -- The area is defined by the Minnesota mainland, which includes the Cannon River floodplain, to the south, Lock and Dam 3 to the west and the main channel on the north and east. Several small lakes and many ponds are found in the Cannon River Delta, an area owned and managed by the Red Wing Wildlife League for wildlife habitat. Sedimentation has altered the habitat quality in this area, yet much of the area is considered to be of good habitat quality for a variety of species. Development on the periphery of the area has affected the connectivity of the Cannon River and its floodplain due to the constrictions imposed by the roads and railroads.

**Pierce County Islands:** river miles 785.0-796.9 -- The area is bordered by the Wisconsin mainland to the north, Minnesota mainland to the south, main channel on the south and Lake Pepin to the east. Several features of special concern exist in the area of upper Pool 4.

The Pierce County Islands Wildlife Area is located entirely within upper pool 4 of the Upper Mississippi River, approximately 1 mile west of Bay City, Wisconsin in Pierce County. The Wildlife Area borders the upstream end of Lake Pepin, a large riverine lake that is part of the Upper Mississippi River. The Pierce County Islands Wildlife Area is the only publicly-managed waterfowl area and refuge along this section of the Mississippi River in Wisconsin, an area which stretches from lower Lake Pepin to Prescott, a distance of about 50 river miles. The Upper Mississippi River National Wildlife and Fish Refuge, managed by the U. S. Fish and Wildlife Service, begins just below Lake Pepin. This wetland complex was acquired by the Wisconsin Department of Natural Resources in 1984. Currently, a portion of this wetland complex is designated as a "no-entry waterfowl refuge" from September 1 to December 31 to minimize disturbance of waterfowl during the fall migration. A unique feature of the no-entry closed area is a system of three old dikes that were constructed by a previous landowner for the purpose of water level control (circa 1930) and managed as a waterfowl hunting club. An artesian spring in the upstream impoundment was used to provide water to these impoundments. This spring is still functional and serves as a water source for the wetlands in the no-entry refuge. The Management Plan for the Pierce County

Islands Wildlife Area identified rehabilitation of the dike system as a management strategy to improve the area for migratory waterfowl and shorebirds.

Additional aquatic areas within this area of upper Pool 4 include: the Wisconsin Channel which is currently considered fairly good secondary channel habitat; Mud Lake, Dead Slough Lake and Goose Lake have been severely impacted by fine sediment deposition and are considered of a poor habitat quality for a variety of aquatic species.

**Lake Pepin:** river mile 764.5-785.0 -- The upstream boundary is loosely defined as the Pierce County Islands near Bay City, Wisconsin. The downstream boundary of Lake Pepin is the Chippewa Delta. Lake Pepin is a naturally formed lake formed by the impoundment caused by glacial outwash from the Chippewa River. Water levels in Lake Pepin have also been raised due to the impoundment of the Mississippi River resulting from the construction of Lock and Dam 4. Lake Pepin is shallow where the Mississippi enters it and averages 25-30 feet deep in the middle and lower extent. Sedimentation has covered the pre-settlement lake bed except in the lowermost area that retains significant areas of gravel substrates. Wind driven wave action in the Lake maintains a beach zone of cobble sized rock and coarse sand. Sedimentation studies conducted in the upper end of Lake Pepin predict that approximately 1/3 of the lake volume will be filled by sediment within the next 100 years if present rates of sedimentation continue.

Lake Pepin is still considered good to excellent habitat for many species of fish. The pre-impoundment assemblage of fish species is still present at approximately the same level of dominance given the increase in numbers of exotic species. Waterfowl habitat for divers still exists in many areas of the Lake even with the decline in submersed vegetation.

**Chippewa River Delta:** river miles 760.1-765.0 -- This area is bounded by Lake Pepin on its upstream end (west), Highway 25 between Nelson, Wisconsin, and Wabasha, Minnesota on the down stream end (east) and by the Minnesota and Wisconsin mainlands to the south and north, respectively. The Chippewa River Delta includes the Nelson Trevino State Natural Area and Tiffany Bottoms Wildlife Management Area. The Upper Mississippi River National Wild Life and Fish Refuge begins at the Chippewa River Delta and continues south to just above Rock Island, Illinois. Much of the Refuge owned property in this area is closed to waterfowl hunting.

The Chippewa River is a major contributor of sand, in the form of bed load, to the Mississippi River. This sand transport and deposition in the Mississippi River influences channel maintenance activities in Pools 4-7. Aquatic and terrestrial areas in lower Pool 4 have been impacted by past dredging activities and continue to be impacted due to slow revegetation of historic disposal sites. Presently, environmentally sound and economically feasible disposal sites in this area are becoming increasingly difficult to locate and will need further attention in the future. This sand deposition in the floodplain the Mississippi River has also impacted numerous backwaters and secondary/tertiary channels in lower Pool 4 through Pool 5A.

There are several human actions and historic features in the Chippewa River Delta which influence habitat quality. Hydropower peaking on the Chip results in frequent "flash floods" of the Chippewa delta area. This results in altered sediment transport patterns and stranding of aquatic organisms. An abandoned railroad grade crossed through the delta floodplain and influences sediment transport and hydraulic connectivity of the area. However, this railroad grade also provides habitat for many species, therefore modification must be carefully evaluated. Finally, much of the delta area was impacted during the heyday of logging in the Chippewa River pineries. Most notable are modifications to Beef Slough, a distributary channel of the Chippewa.

**Indian Slough/Big Lake:** river miles 755.5-760.1 -- Highway 25 between Nelson, Wisconsin, and Wabasha, Minnesota forms the upstream (western) boundary of this area. The southern boundary of this area is the main channel with the northern boundary formed by the Wisconsin mainland. Indian Slough and Catfish Slough provide the major input of flow into this backwater complex. Both of these sloughs have had modifications made to their inlets in an effort to reduce sediment input into the backwater complex. The Indian Slough closure also incorporated features to improve fisheries habitat via tree drops and the construction of a riffle-pool complex. The area has seen a decline in aquatic vegetation and consequently a reduction in the habitat value of the area. Island erosion and dissection is resulting in a simplification of the habitat in this area and contributing to a loss in velocity and bathymetric diversity.

**Robinson Lake:** river miles 756.5-759.5 -- Located downstream of Wabasha, Minnesota, this area is bordered by the main channel to the north and east, and to the south and west by the Minnesota mainland. Much of the area has seen a reduction in habitat quality due to sedimentation and erosion of terrestrial habitat. Historically, Zumbro River tributary channels entered into Robinson Lake. Much of the shoreline around Robinson Lake developed as residential sites.

**Peterson Lake:** river miles 753.7-756.6 -- Peterson Lake is bordered on the downstream side (south) by the Lock and Dam 4 dike, north and east by the main channel and the west by the Minnesota mainland. The area has seen significant erosion of island which once bordered the eastern side of the complex. Many of the remaining islands were protected in 1995 as part of the Peterson Lake HREP. At the same time, some of the islands were "replaced" utilizing rock structures to reduce sedimentation and velocities in Peterson Lake. A small amount of dredging also occurred at the same time. The inlets through the Lock and Dam 4 dike to the Finger Lakes culverts "pull" water from the Peterson Lake area. The Minnesota shoreline of Peterson Lake has been developed as home and commercial sites.

**Beef Slough/Reick's Lake:** river miles 752.8-757.2 -- This area is bordered on the west by the main channel and Big Lake area, south by Lock and Dam 4, north by Wisconsin mainland and continues up the Buffalo River flood plain approximately 3 miles upstream of the Highway 35 bridge. The Buffalo River has significantly altered much of this area due to suspended sediment deposition. Beef Slough and Tank ponds were cut off via construction of the railroad making them susceptible to sedimentation from the Buffalo River. Currently (2001) the Reick's Lake area is important migratory habitat for migrating waterfowl, especially tundra swans. However, continued sedimentation will eventually eliminate the value of this area as a stopover except during periods of very high fall water levels.

**Zumbro River Delta:** river mile 745.0-760.1 (751.2-760.1 in Pool 4) -- The Zumbro River is the largest tributary to enter Pool 5, at approximately river mile 750. Historically, the Zumbro River floodplain was dissected by numerous channels and seasonally isolated lakes and ponds. Flows moved laterally within the floodplain, sometimes north towards what is now Pool 4, while at other times flowing south into what is now Pool 5. During flood events, the Zumbro River flowed in both directions across a diverse and natural floodplain. In the mid 1900's, approximately the lower 4 miles of the Zumbro River was straightened and isolated from its floodplain by levees. Additionally, when Wabasha Co. 24 was elevated it severely restricted floodplain and channel connectivity with the Mississippi River. Remnant channels, floodplain depressions and wetlands throughout the historic Zumbro River delta are all that remain from what was once a very dynamic floodplain ecosystem. The area is now only inundated when Mississippi River water levels become high enough for water to either backup or seep into these areas. There also has been a large net loss of floodplain forest, prairie, and wetland habitats due to most of the area being converted to agricultural use.

### ***Unique Attributes, Opportunities And Constraints***

Thermal inputs from the Prairie Island Nuclear Power Plant will be reduced if possible. Private landowners will be encouraged and provided with incentives to protect and restore native plant communities on their riparian, blufftop and floodplain lands. Significant bald eagle roosting areas exist in Upper Pool 4 and at the mouth of the Chippewa River. These areas will be protected from riparian development and environmentally harmful channel maintenance activities.

The rate of filling in Lake Pepin will be reduced to 10% of its 20<sup>th</sup> century rate.

The Mississippi River in this area once supported more than 40 species of freshwater mussels and migratory fish once moved through this reach on their way to spawning grounds and wintering areas. With improvements to water quality and the physical integrity of these rivers, the opportunity to reestablish populations of lost species presents itself and will occur in the future.

### ***Summary of Potential Actions to Achieve Desired Future Habitat Conditions***

Often the actions proposed and described below are interrelated and specific actions will require overlapping solutions. The goal of these actions is to increase diversity in the pool. Increasing and sustaining a diverse aquatic and terrestrial habitat base in the pool is the key to improving the health of the Mississippi River. These actions, combined with others taken in adjacent pools, will improve the health of the Mississippi River.

#### **1.) Maintain existing quality habitat.**

A key to the desired future is to protect and maintain existing terrestrial and aquatic habitat. Some areas within the pool are considered as quality habitat for a variety of species. Maintenance of existing quality habitat may be as simple as leaving it alone and monitoring its condition. Specific actions would be identified if long-term declines in habitat quality in the area are noticed.

#### **2.) Protect and restore islands.**

Stabilization of islands in Pool 4 will be undertaken to reduce the rate of island erosion and island dissection. This will help maintain a diversity of depths, velocities and substrate. It will also keep selected backwater areas free from flow.

Island formation will be promoted. Where necessary, islands will be constructed to improve terrestrial and aquatic habitats. The constructed islands will be oriented to promote scour and sediment deposition to increase depth, velocity and substrate diversity. The islands will improve water quality conditions (decrease sediment resuspension) and promote the establishment and maintenance of aquatic vegetation.

The primary locations where islands will be formed to restore and enhance floodplain structure are the Indian Slough/Big Lake, Peterson Lake, Robinson Lake and Beef Slough/Rieck's Lake areas. Islands in these areas will also improve habitat diversity and quality through the promotion of secondary and tertiary channel development and diversification of water velocities in the impounded reach.

A reduction in sediment resuspension in these areas will also reduce fine sediment input to Pool 5. Reduction in sediment resuspension will also improve environmental conditions for the establishment and maintenance of aquatic vegetation.

### **3.) Increase depth diversity in channels and backwaters.**

Managing sediments in Pool 4 is important in maintaining, enhancing or restoring habitat. In the main channel, recommendations contained in the Channel Maintenance Management Plan must be followed. Dredged material may be used to construct islands in various locations. Historic dredged material placement sites will be restored to native plant communities.

Efforts will be made in the upper and lower sections of the pool to increase secondary and tertiary channel habitat. Maintenance and formation of these channels will consider a variety of factors aimed at providing for a diversity of habitats (undercut banks, mud banks, snags, etc.) and substrate types. Where feasible, restored channels will be defined by land border to further diversify the habitat these channels will provide. Dredging, directing flows or other techniques may be used to optimize depth diversity.

### **4.) Manage floodplain forest and prairie communities for diversity and quality.**

Managing terrestrial plants will focus on maintaining, enhancing and restoring healthy forest communities interspersed with grasslands and wet meadows. Management actions include restoring historic dredged material placement sites with native plants; decreasing the dominance of reed canary grass; protecting, restoring and enhancing prairie communities and managing for their continuance; and reducing or eliminating purple loosestrife by continuing control methods and implementing new ones. Privately owned property may be managed through landowner education and incentives, conservation easements or purchase from willing sellers.

Efforts will be made to promote the development and maintenance of mud flat and sand bar habitat. Due to sediment input to pool, sand bar habitat has a high potential of being encouraged, but mud flat potential is low. If mud flat habitat does occur, it is quickly colonized by plants. Robinson and Rieck's lake have potential for mud flats -- essentially, the further from the main channel and flowing side channels, the greater the likelihood of mud occurring. These habitats are important for shorebirds, turtles, have differences in plant germination dependent on substrate type and can be a good food and spawning resource for fish and wildlife.

The present forest community dominated by maple is not long lived nor is regeneration of the forest community occurring due to many factors (higher water table, reed canary grass, land elevation, etc.). Forest management will include measures to restore disturbances and control of reed canary grass (logging, maybe floodplain dynamics) in the Chippewa delta and elsewhere. However, consideration will be given to include management of some of the areas which are homogenous in species composition/age, but valuable for other species that need large tracts of unbroken forest. Also, land management practices will take into consideration unique needs of state and federal endangered and threatened species.

Connectivity for terrestrial species will be addressed through the management of habitats in optimal blocks to meet a critters needs. This may include the development of "travel" corridors between larger blocks of habitat or managing for large blocks of habitat. Areas in Pool 4 most suited for consideration of these measures include the deltas of the Cannon, Chippewa and Zumbro Rivers.

Prairie restoration will occur in the Chippewa Delta area and Zumbro River. A variety of measures will be implemented may include incentives for private landowners to restore prairie, easements and acquisition from willing sellers.

### **5.) Manage water levels to improve aquatic habitats.**

Managing aquatic plants will focus on maintaining, enhancing and restoring healthy submergent, floating and emergent plant communities with optimal distribution and high diversity. 1939 aquatic vegetation conditions represent an optimal mosaic and assemblage of habitat desired for lower Pool 4. However, some areas now are more conducive for other purposes or communities. Any description of desired vegetation communities must consider that areas void of vegetation are also important. For lower Pool 4, it is reasonable to expect emergent vegetation to the 1 foot depth, mixed to 2.5 feet and submersed out to 6 feet. The submersed vegetation would be a transition of almost 100% coverage in shallower depths (<3 feet) to less than 5% coverage at the 6 foot contour. The exact location of aquatic vegetation will vary due to substrate, water velocity and wind fetch which in combination will affect specie composition, density and diversity.

Aquatic vegetation diversity and coverage will be enhanced in the Pierce County Islands, Indian Slough/Big Lake, Peterson Lake, Robinson Lake and Beef Slough/Rieck's Lake areas through modifying flow distributions, increased light penetration due to the formation of islands and changes in sediment characteristics. Aquatic vegetation in sections of Pool 4 below Lake Pepin may also be benefited through implementation of periodic pool wide water level management.

### **6.) Manage river flows and connectivity to improve aquatic habitat.**

Human alterations have resulted in numerous changes to the water flows within Pool 4. Identification and modification of channel training structures to promote a diversity of aquatic habitat will be done. Modifications of the abandoned railroad grade in the Chippewa River Delta will be investigated to improve the hydraulic connectivity of the floodplain in this area.

Measures will be taken in all areas of the pool to restore and maintain aquatic and terrestrial connectivity to assure the habitats are available and accessible at the time fish and wildlife need them to meet life cycle needs. For aquatic organisms, this will entail modification of closing structures, promoting the formation of or creating channels, and removals of any barriers to increase the spatial and temporal connectivity of habitats. Connectivity with pools 3 and 5 will be improved through the implementation of structures or dam operation measures to increase fish passage at these dams.

The channel of the Zumbro River has been channelized and flows directly into the navigation channel of the Mississippi River. This has eliminated or degraded the natural processes, productivity and connectivity of the historic Zumbro River delta. A project will be implemented to investigate potential measures for restoration of the Zumbro River's historic channels and associated floodplain habitats.

A portion of the Pierce Counties Wildlife area will be managed as a moist soil unit to improve the quality and availability of wetland habitat in upper Pool 4 for wetland species. The development of the moist soil units will incorporate features which will improve the condition of the area for fisheries spawning habitat.

Modifications will be made to provide for fish passage around or through Lock and Dam 3 and 4 with greater frequency and ease for all species of river fish. For example, recreating a permanent flowage through the Vermillion river bottoms will allow fish to move between Lock and Dam 3 tailwaters (Pool 4) and Pool 3 at Hastings, MN.

**7.) Support watershed management programs.**

Positive land use in the tributary watersheds should be encouraged to reduce sediment, nutrient and other pollutant inputs into Pool 4. Urban areas are also included within the watershed and along the river. Solutions to eliminating point source pollution should be supported and implemented.

**8.) Work cooperatively with private property owners.**

There are several areas within the Mississippi River floodplain and the majority of the tributary watersheds which are privately owned. Maintaining and improving habitat within the floodplain of the Mississippi is dependent on a long-term commitment to provide resources to private landowners to improve water quality, reduce erosion and sedimentation, and improve habitat conditions on land within the floodplain. Various approaches and techniques will be evaluated and implemented to work cooperatively with private property owners. Some of the tools include: voluntary measures, land owner incentives, easements from willing owners and purchase of land from willing sellers.

The opportunities for implementation of this tool in Pool 4 are located in the Zumbro River area, Cannon River, Chippewa River, and various areas along Lake Pepin.